Risk Management

U.S. Census Bureau
Suitland, MD
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Objectives

- Overview: CMMI Acquisition v1.2 Risk Management process
- Emphasize risk mitigation and tracking
  - Risk mitigation planning
  - Estimating mitigated risk ratings
  - Tracking risk factors and risk mitigation actions

NOTE: The SEI uses Webster's definition of risk –

***Risk is the possibility of suffering loss*.**

The SEI CMMI(SM) Continuous Risk Management process …

Reference: Capability Maturity Model® Integration (CMMI), Acquisition Model, Version 1.2.

Risk identification – citing events that MIGHT happen and result in undesired consequences

- Examine program plans, work streams, project or milestone review artifacts, deliverables
- Consider key factors
  - Timing
  - Dependency
  - Contribution
  - Entrance and exit criteria
- Additional sources used to identify risks
  - Stakeholders
  - Quality Assurance Audits
  - EVMS (Earned Value Management System)
- Record information on the Risk Identification Form

Risk Analysis – evaluates both likelihood of occurrence and estimated impact, and recommends risk response

- Process for validity and duplicity
- Estimate likelihood of occurrence
- Estimate impacts
  - Cost
  - Schedule
  - Functional Performance
  - [Other … as decided]
- Establish severity
- Recommend risk mitigation actions and estimate mitigated severity

"Likelihood" – the estimate of the chance an event will occur

Illustrative

LIKELIHOOD		PROBABILITY ESTIMATE CRITERIA
Highly Likely	**High (H)** (>70%)	…will not avoid the risk event (Less than 30% chance it **will not** happen.)
Likely	**Medium (M)** (30%-70%)	…may avoid this risk and an alternative may be available. (About a 50% chance it will happen.)
Possible but Unlikely	**Low (L)** (<30%)	… will effectively avoid or completely mitigate this risk. (Less than 30% chance it **will** happen.)

NOTE: These are illustrative values. Risk Managers may prefer to use 5 or greater measures.

"Impact" – the estimated result should the risk occur

Illustrative

IMPACT LEVEL		IMPACT CRITERIA		
		COST	SCHEDULE	FUNCTIONAL PERFORMANCE
High	H	>20% deviation from planned budget	Cannot meet key program milestone; major delay expected	Significant shortfall to planned capability/delivered requirement
Medium	M	10%-20% deviation from planned budget	Cannot meet key project/workstream milestone; impact will result in minimal pressure on program end point	Some priority capabilities will not be delivered. Workarounds will have to be used
Low	L	Minimal, <10%, deviation from planned budget	Minimal schedule impact; any milestone slippage will be contained by workarounds	All priority capabilities will be delivered; significant amount of lesser priority requirements may be missing

NOTE: These are illustrative values. Some Risk Managers prefer to use 5 or greater measures.

Severity – the estimated combined effect that a risk's likelihood and impact can have on the program.

Illustrative

		IMPACT		
		LOW	MEDIUM	HIGH
LIKELIHOOD	HIGH	Medium	High	High
	MEDIUM	Low	Medium	High
	LOW	Low	Low	Medium

NOTE:

These are illustrative values. Some Risk Managers prefer to use 5 or greater measures for probability and impact.

Risk Severity should be calculated in a manner that facilitates meaningful risk ranking

trative

METHOD 1: ALPH BASE

LIKELIHOOD	IMPACT	SEVERITY
H	H	H
H	M	H
M	H	H
M	M	M
H	L	M
L	H	M
M	L	L
L	M	L
L	L	L

METHOD 1: NUMERIC BASE

LIKELIHOOD	IMPACT	SEVERITY
3	3	9
3	2	6
2	3	6
2	2	4
3	1	3
1	3	3
2	1	2
1	2	2
1	1	1

NOTE: These are illustrative values. Some Risk Managers prefer to use 5 or greater measures for probability and impact, yielding appropriate changes in the severity calculations.

Risk Identification results are included in the Risk Registry and ranked according to Severity

Illustrative

RISK #	TITLE	DESCRIPTION	SOURCE		LIKELIHOOD	IMPACT	SEVERITY	MITIGATION	LIKELIHOOD	IMPACT	SEVERITY
			AUTHOR	DATE							
1	Uncontrolled requirements changes	Requirements baseline is not maintained; changes are allowed outside the change management process	C. Little	10/1/06	H	H	H	Lock down change control authority; add alerts to PM	L	H	M
2	QA1 environment mismatch	There is not plan to verify that the environments and databases being used for integration of the QA1 production release match the Production System requirements	J. Childs	9/18/07	M	H	H	Conduct environment verification activity	L	L	L
3	Help Desk staff training content	Training of Help Desk staff may not match the design of the deployed equipment	A. Reviewer	12/31/07	M	M	M	Perform spot check reviews as part of training preparation; include review by Development team as part fo Training Readiness Review; Plan for training materials update	L	M	L
4	Incomplete testing	Test plans do not address all critical requirements; testing may allow errors into the production baseline	V. Blue	1/3/08	M	M	M	Add reference to requirement by number in test plan development tool; verify agreement on weekly basis	L	M	L

Example: Analyzing a schedule for risk – different views give different information

Illustrative

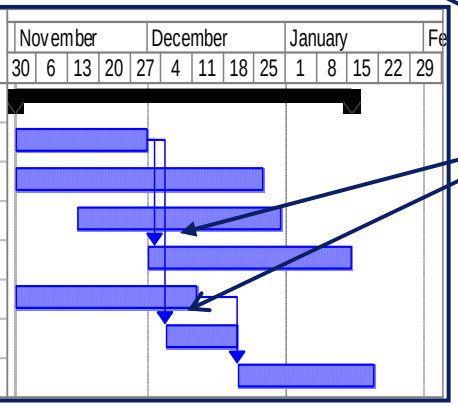
#	CRITICAL PATH ACTIVITIES	START BY	COMPLETE BY	OWNER	ACCEPTED BY
1.0	**Install PeopleSoft/Prepare Environments**				
1.1	DVT	1-Nov	1-Dec	NR	LM
1.2	TST1	1-Nov	26-Dec	NR	LM
1.3	TST2	15-Nov	31-Dec	NR	LM
1.4	QA1	1-Dec	15-Jan	JR	KS
2.0	**Complete Data Conversion**	1-Nov	11-Dec	JM	RH, KS, JZ, WJ

- Same team?
- Staffing conflict?

- New team? Will training complete in time?
- No plan to validate environment?

Illustrative

ID		Start	Finish	Duration	Predecessors
1	**Install Application/Prepare Environments**	**Tue 11/1/05**	**Sun 1/15/06**	########	
2	DVT	Tue 11/1/05	Thu 12/1/05	22 days?	
3	TST1	Tue 11/1/05	Mon 12/26/05	40 days?	
4	TST2	Tue 11/15/05	Sat 12/31/05	34 days?	
5	QA1	Thu 12/1/05	Sun 1/15/06	32 days	2
6	Complete Data Conversion	Tue 11/1/05	Sun 12/11/05	29 days?	
7	CRP #1 - Validate security profiles	Mon 12/5/05	Tue 12/20/05	12 days?	2
8	CRP #2 - Setup Employee Profile	Wed 12/21/05	Fri 1/20/06	23 days?	6



Holiday time issues?

Dependencies - confidence that DVT will finish on time?

Options for handling risks…

- **Risk *avoidance*:** changing or lowering requirements while still meeting user needs
- **Risk *control [Risk Mitigation]*:** taking active steps to minimize risk effects
- **Risk *transfer*:** reallocating requirements to lower risks
- **Risk *monitoring*:** watching and periodically reevaluating the risk for changes in assigned risk parameters
- **Risk *acceptance*:** acknowledging risk but not taking specific action

The Risk Management Plan documents the strategy, the organization, and the procedure for managing the risk

- Strategy – defines the scope and emphasis of the Risk Management program
  - Risk mitigation priorities and thresholds
  - Business continuity and contingency planning elements
- Organization – roles, responsibilities, qualifications of individuals, training and governance structure
- Risk management procedure – Program-specific workflow, expected outcomes, control points, and measures of effectiveness

Consider impacts of risk mitigation when building a risk-mitigated schedule

Decision: Implement mitigation actions

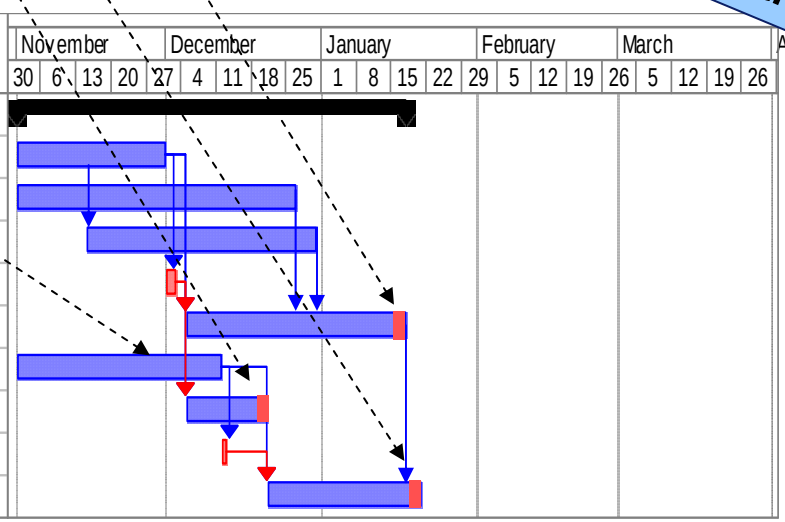
- Mitigation provided superior confidence in milestone achievement
- Cost of mitigation far outweighed the potential cost impact of risk if realized
- Schedule impact was containable within overall schedule

Risk mitigation activity (line 5) added

Resulted in schedule slip for QA1 and other activities

Illustrative

ID	Task Name	Start	Finish
1	**Install Application/Prepare Environments**	**Tue 11/1/05**	**Tue 1/17/06**
2	DVT	Tue 11/1/05	Thu 12/1/05
3	TST1	Tue 11/1/05	Mon 12/26/05
4	TST2	Tue 11/15/05	Sat 12/31/05
5	Validate data conversion environment	Thu 12/1/05	Fri 12/2/05
6	QA1	Mon 12/5/05	Tue 1/17/06
7	Complete Data Conversion	Tue 11/1/05	Sun 12/11/05
8	CRP #1 - Validate security profiles	Mon 12/5/05	Tue 12/20/05
9	CM Configuration Status Audit	Mon 12/12/05	Mon 12/12/05
10	CRP #2 - Setup Employee Profile	Wed 12/21/05	Fri 1/20/06



Evaluating impact: Calculating the risk business case…

Illustrative

Today's date: _____

Project Value ($K): $ _____ **Completion Date:** _____ **Days remaining:** _____

Risk: _____

Header

Likelihood: _____ **Impact:** _____ **Severity Level:** _____

Estimated impact if risk is realized:

Cost ($K): _____ Schedule: _____ Functional Performance: _____

% _____ Days slip _____

$ _____

Estimated Impact

Estimated expense of mitigation:

Cost ($K): _____ Schedule: _____ Functional Performance: _____

% _____ Days _____

$ _____

Expense to Mitigate

Estimated impact after risk mitigation:

Cost ($K): _____ Schedule: _____ Functional Performance: _____

% _____ Days slip _____

$ _____

Mitigated Likelihood: _____ **Mitigated Impact:** _____ **Mitigated Severity Lev**

Estimated Impact post-Mitigate

Net Benefit of Mitigation:

Cost ($K): _____ Schedule: _____ Functional Performance: _____

% _____ Days slip _____

$ _____

Cost – Benefit

Tracking risk factors and risk mitigation actions on a regular basis

- Timing considerations – when do risks need to be reviewed?
- Update risk analysis and the profiles in the Risk Registry
  - Review risk and risk mitigation ownership
- Update risk mitigation plans
- Update risk mitigation activities (and the Master Schedule)
- Adding tracking events into the Master Schedule (Risk Management Schedule)
- Collect information and measure the effectiveness of the Risk Management program

Control ---

- Risk mitigation actions require the same controls as the program
  - Planning
  - Oversight
  - Checkpoints
- Initiate business continuity contingency plans if risk is realized
  - An issue = a risk that has been realized

Communication ---

- Encouraging free-flowing information at and between all project levels
- Enabling formal, informal, and impromptu communication
- Using processes that value the individual voice (bringing unique knowledge and insight to identifying and managing risk)
- Automate – where practical

Risk Mitigation Report records the analysis, implementation of risk mitigation actions, and results of tracking actions

- Analysis – captured in the Risk Registry
  - Either a summary and/or detailed views
- Implementation – view of mitigated Master Schedule
  - Includes summary of control activities
  - Showing sufficient detail to understand actions and ownership
- Results of Tracking
  - Effectiveness of mitigation actions
  - Lessons learned
  - Changes needed in risk management process
- Look ahead
  - Expectations for the next (30? 60? 90?) days

Risk Overview - Summary graphics are typically used to quickly assess risk status

Illustrative

Comparison of risk profiles – before and after mitigation

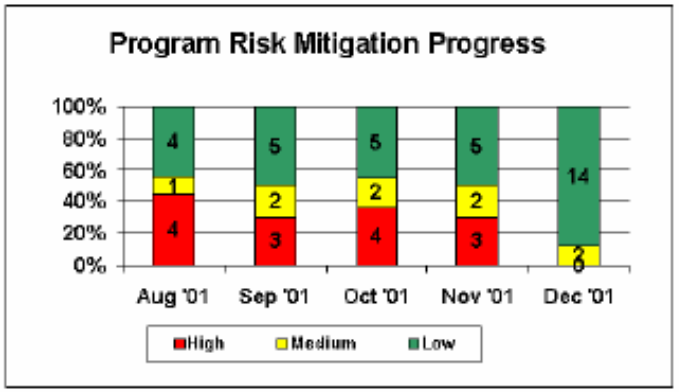
Initial Assessment

PROBABILITY	IMPACT: Low	IMPACT: Medium	IMPACT: High
High		004 006 019 021 024	001 002 010 014 022 023
Medium		008 009	
Low			011 017

After Mitigation

PROBABILITY	IMPACT: Low	IMPACT: Medium	IMPACT: High
High			
Medium	004	001 002 006 010 014 024	
Low		008 009 011 017 019 021 022	023

Example of risk trend graphic



Special considerations ---

- Risk organization
  - Risk Manager
  - Risk Owner
  - Risk Mitigation Owner
- Effectiveness of the risk management system
  - Metrics and measures
- Reporting – match to program practices
- Business case for the risk management program (cost of RM)

Summation and close ---

- Reviewed CMMI Acquisition v1.2 Risk Management process
- Discussed approaches to identifying, analyzing and addressing risk
  - Business case analysis
  - Risk Management Schedule
- Presented concepts for reporting risk management activities
- Covered special topics